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UNCLASSIFIED- SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION — 1959

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PLEASE NOTE

This report contains unevaluated information on Soviet Bloc International Geophysical Cooperation activities selected from foreign-language publications as indicated in parentheses. It is published as an aid to United States Government research.

INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION

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I. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Tashkent Observatory Conducts Photographic Observations of Satellites

Investigations on the problems of artificial earth satellites were begun in the Tashkent Astronomical Observatory of the Academy of Sciences Uzbek SSR in 1958.

The observatory is engaged in photographic observations of satellites which make possible the most precise determinations of their equatorial coordinates with the simultaneous registration of precise time. The first photographic observations of Sputnik II were made on 9 December 1957 by A. A. Latupov, who used a small camera. A special NAFA-3s short-focus camera was installed in the observatory later. Observations of Sputnik II and III, and of Sputnik III's carrier rocket were also conducted. A total of about 80 photographs were obtained. Photographic observations of Sputnik III are being continued at present. ("In the Tashkent Astronomical Observatory," I. M. Ishchenko; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Fiziko-Matematicheskikh Nauk, No 6, 1958, p 87)

II. UPPER ATMOSPHERE

Intensity of Cosmic Ray 27-Day Variations in the Stratosphere

The investigation of variations of the 27-day periodicity of cosmic rays according to the data of low-altitude measurements is a complex problem and is liable to error. To obtain more direct data on variations of primary cosmic rays a large series of measurements on the intensity of cosmic rays were conducted in the stratosphere, using sounding balloons. These measurements are part of the IGY program. They were made regularly from 1 July 1957 on at two geomagnetic latitudes: (1) near Moscow ($\lambda = 51^{\circ}$, Station Dolgoprudnaya, scientific station of the Physics Institute, Academy of Sciences USSR), and (2) in the Murmansk region ($\lambda = 64^{\circ}$, Station Loparskaya, northern scientific station of the Academy of Sciences USSR). Instruments were launched at both latitudes, as a rule, at the same time each day (principally at 0900 or 1000 Moscow time).

Some results of measurements made at latitude 51° from 1 July 1957 to 1 February 1958 and at latitude 64° from 1 July 1957 to 1 October 1957 using the RK-1 radiosonde are given.

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The RK-1 radiosonde carried a thin-walled self-quenching counter for charged particles, type STS-6, the pulses from which, in a specified manner, were formed and then fed into a radio transmitter, and were registered on Earth with an apparatus consisting of a radio receiver connected with a scaling circuit and a mechanical indicator. Readings of the mechanical indicator were taken once every minute.

A barograph gave altitude measurements. As the barograph needle passed contact points, short pauses occurred in the transmission of the signals. The altitude was determined by fixing these interruptions. The flight weight of the RK-1 radiosonde, including the power source, which is calculated for 6-8 hours of operation, is 2.2 kilograms.

The counter was graduated by measuring the number of impulses caused by a radioactive compound. Measurements were conducted with a statistical accuracy of 0.4 percent. On the basis of this graduation, corrections, taking into account the difference in the effectiveness of the counters, were introduced in the final results of measurements made in the stratosphere.

The STS-6 counter used in the work registered an average of about 2,000 impulses per minute during a maximum intensity of cosmic radiation, which gives 2% a statistical accuracy for one-minute measurements. The greatest accuracy in determining variations of cosmic rays in the stratosphere can be obtained from data pertaining to the maximum intensity curve, as there are no high requirements for precise altitude determinations and it is possible to average the results for a relatively long period of observations. In the measurements conducted, this period of time was equal to 10-12 minutes. The statistical accuracy of measurements of the intensity of cosmic rays during the maximum for each flight was $\sim$ 0.8 percent.

Data presented in graph form show the periodicity in the variation of the intensity of cosmic rays in the stratosphere in both latitudes, 51° and 64°. Also visible in the illustration is the presence of the correlation of wave phases in the stratosphere and at sea level. The amplitude of the waves in the stratosphere is eight to ten times larger than the amplitude of the waves at sea level. The latter indicates that the variations which were studied are caused in a great degree by low-energy primary cosmic particles. From data on magnetic storms it follows that a connection between the variations in the intensity of cosmic radiation and the presence of magnetic storms does not exist in each case.

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The detection of the period of recurrence of variations in cosmic radiation is of interest. From the illustration it is possible to note 15 semiperiods which occurred during the entire 212 days the measurements were made (at latitude 51°). If we accept that because of the uncertainty of the beginning of the cycles, the number of semiperiods were determined with an accuracy of one semiperiod, then the duration of one semiperiod is obtained as equal to $215/15 = 14.3 \pm 1$ day.

During the period from 11 July to 29 October 1957, measurements in the stratosphere were conducted by M. A. Pomerantz and others. The authors report that the data of their preliminary analysis indicate the existence of 27-day variations in the intensity of cosmic radiation in the stratosphere. It is submitted that by improving the methods of processing and of obtaining new measurement data it will be possible to detect changes during the period of the variations of cosmic radiation in the stratosphere and to find new relationships of these variations with the Sun. ("Twenty-Seven-Day Variations of Cosmic Ray Intensities in the Stratosphere," by S. N. Vernov, Corresponding Member, Academy of Sciences USSR; V. F. Tulinov; and A. N. Charakhch'yan; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 5, 11 Oct 58, pp 788-791)

III. METEOROLOGY

Study of Ellipticity in the Polarization of Scattered Light

An account of work conducted for obtaining preliminary information on the degree of ellipticity of light scattered by the layer of the Earth's atmosphere and the nature of its dependence on the angle of scattering is presented in a scientific periodical article. The experiments were conducted in the foothill regions of the northern Caucasus during the latter part of September 1957.

The degree of ellipticity (q) was found to have a distinct relationship to the angle of scattering (ϕ).

The fact of the detection of ellipticity in the polarization of scattered light does not in itself present anything unexpected from a theoretical viewpoint. However, the establishment of this circumstance, that the degree of ellipticity (q) is sufficiently large, and an explanation of the conditions necessary for measuring q and finding the nature of the relationship of $q(\phi)$ are essential from the viewpoint of future investigations in the field of light scattering, especially scattering by colloids and aerosols. Extremely important, in particular, is the possibility of obtaining information related separately to the non-Rayleigh component of scattered light, as well as for the Rayleigh component $q = 0$. The authors say that the study of the angular and

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and spectral relationship of q makes it possible to substantially expand the over-all information on a scattering medium and substantially aids advancing the development of experimental methods of solving the reverse problem of the theory of scattering, that is, the optical methods of determining the structure and properties of the scattering media. ("Experimental Detection of Ellipticity in the Polarization of Scattered Light," by G. V. Rozenberg and I. M. Mikhaylin; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 1, 1 Sep 58, pp 62-64)

Basic Types of Motions of a Baroclinic Atmosphere in a Field of Coriolis Force

The classification of the principal types of dynamic processes in the atmosphere (horizontal vortex movements, and gravitational and acoustical waves) whereby the filtering role of quasi-static approximations are explained is given on the basis of solving the problems of small fluctuations of a baroclinic atmosphere. ("Basic Types of Motions of a Baroclinic Atmosphere in a Field of Coriolis Force," by A. S. Monin and A. M. Obukhov, Corresponding Member of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 1, 1 Sep 58, pp 58-61)

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IV. GLACIOLOGY

The Conquest of the Fedchenko Glacier

Investigations of the world's largest mountain glacier, the Fedchenko Glacier, known for its impregnability, are being continued for the second year. Scientific detachments from the Academy of Sciences Uzbek SSR, Moscow, Leningrad and the countries of the People's Democracies have penetrated the most distant corners of the glacier field at altitudes ranging from 3,000 to 7,500 meters (Stalin Peak), step by step discovering the secrets of this enormous glacier. The complex meteorological conditions of the high-mountain summer created many obstacles in the path of the explorers. The deep ice crevasses, hidden by snow, the frequent show storms and snow falls, the low temperatures, and oxygen starvation aggravated the difficulties. However the work continued day and night. For the first time, in imitation of Antarctica, seismic methods of prospecting for determining the thickness of the ice were used. A series of transverse and longitudinal profiles of the glacier's mass were obtained as a result of this work making it possible to judge very accurately the ice reserves feeding melt waters of many Central Asian rivers. Seismologists established that the thickness of the ice in the terminal part of the glacier reaches 200 meters. It gradually increases in thickness as one proceeds to its upper parts.

Simultaneously with these investigations, observations were conducted on the discharge of melted glacier waters into all of the largest rivers of the basin: Sel'dara, Balyandkikh, Malyy Tanymas, and Kainda. Temporary hydrological posts with a full set of water gauge works were constructed. It was found that there was an unprecedented amount of discharge in 1958. In the summer floods, the Sel'dara River carried more than 500 cubic meters per second, destroying the previous bed and creating tens of new powerful streams.

The geomorphological expedition noted many interesting peculiarities in the development of glaciers. By comparing the location of the terminal parts of the glacial tributaries with cartographic materials of previous years, they established that recently many glaciers have noticeably receded and decreased in size. The main body of the Fedchenko glacier has changed in outline, receding more than 10 meters in only one year.

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At present, geomorphologists are revising the map of old icing on the glacier, which, in the period of maximum phase of the development of Pamir glaciers, extended more than 150 kilometers and was enormously thick.

The detachment for studying the physicomechanical properties of the ice also continued its investigations. At the 5,000 meter level, a special ice laboratory was built in the body of the glacier at a depth of 5-7 meters below the surface where under constant minus temperatures the studies on the processes of the formation of ice crystals, the recrystallization of the firn into ice, and other properties of glacier ice were conducted.

In addition to ground observations, a detailed aerial photographic survey of the whole glacier basin for an area of more than 1,500 square kilometers was conducted. This will be the basis on which the latest maps of modern glaciation will be compiled. Many glaciers, outlets of the Fedchenko Glacier, were investigated for the first time this year, and new geographical denominations were obtained: Akademii Nauk Uzbek SSR, MGG [International Geophysical Year], Dorofeyeva and Parashyutnyy. They are located at the very sources of the Fedchenko Glacier at heights of more than 5,000 meters above sea level.

At present the detachments of the summer expedition have come down from the glacier and have begun to process the obtained materials. The winter workers of the scientific stations of the Academy of Sciences Uzbek SSR are ready for their second winter in the scientific stations, "Lednik Vitovskiy" and "Lednik Fedchenko-2". ("Conquest of the Fedchenko Glacier," by V. F. Suslov; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Fiziko-Matematicheskikh Nauk, No 8, Aug 58, p 89)

V. OCEANOGRAPHY

Severyanka Ends Second Voyage

A telephoned report from Murmansk on 25 January reveals the return of the scientific research submarine Severyanka to port after a long voyage of several thousand miles. The survey of the sea depths, a joint enterprise by scientists of the All Union Scientific Research Institute of the Fish Economy and Oceanography (VNIRO) and scientists of the Polar Institute, produced good results.

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V. G. Azhazha, chief of the expedition, gives this information: The voyage lasted 24 days, during which storms raged for 22 days. First observations have already shown that a submarine can search for fish in any weather. Herring can be discovered with the echo finder much easier than from on board a commercial trawler. The behaviour of the fish is clearly seen on the echogram and observations are checked through the portholes.

A very interesting marine animal was seen which none of the members of the expedition could classify. This rare specimen of marine fauna had a transparent body resembling a lily with orange and varicolored spots. Its thin paws were covered with spots.

The scientific material collected on the expedition is still to be processed, however it may already be said that it is of great value. The scientists observed the migration of herring to their spawning grounds. It was found that at night, herring are in a very passive state, as if in a torpor. The submarine's appearance did not frighten them. They reacted weakly to electric light. However, in the morning the herring revived and disappeared from view.

The expedition also conducted studies on the radioactivity of the sea water and studies on wave motions. ("On the Water and Under the Water," by A. Vorob'yev; Moscow, Pravda, 26 Jan 58, p 6)

CPYRGHT

A photograph showing two members of the expedition on board the submarine which appeared in Sovetskiy Flot is captioned: V. Fomin, junior scientific associate of the Severyanka at the electronic thermo-salinometer. This instrument makes it possible to obtain data directly on the temperature and salinity of outside waters at various depths. At left -- K. Antonovich, seaman. (Moscow, Sovetskiy Flot, 22 Jan 59, p 4)

CPYRGHT CPYRGHT

Two photographs in Izvestiya show two members of the expedition in the submarine, and a view forward [?] of the sea. These are captioned: Severyanka en route. Above -- V. Azhazha, chief of the expedition, and G. Yalovko, navigator, plotting the course during the trip. Below -- The Severyanka under way. ("Severyanka en route"; Moscow, Izvestiya, 27 Jan 59, p 6)

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Vityaz' Off Coast of Mexico

A radio report from N. Sysoyev, Candidate of Technical Sciences, and chief of the expedition on the Soviet oceanographic ship Vityaz', places the position of the ship in the Pacific off the coast of Mexico.

The expedition has already made 22 stations and completed operations, over and above the program, begun in honor of the 21st Congress of the CPSU.

The other day work was begun on investigations in an enormous oceanographic traverse along the 20th parallel. ("Vityaz' Continues Investigations," by N. Sysoyev, Chief of Expedition on Vityaz'; Moscow, Sovetskiy Flot, 22 Jan 59, p 4)

Report on Sedov Expedition in Atlantic

The expeditionary ship Sedov occupies an important place in the plan of Soviet oceanographic operations. Some of the investigations conducted in the Atlantic Ocean aboard this ship are described in an article by Academician V. V. Shuleykin. These particular investigations were conducted during the last 3 months of 1957 during the winter storm season, as the Sedov ranged a wide region of the Atlantic conducting observations on waves in the different phases of their development, and at various distances from storm areas. In this manner, the theories and conclusions obtained at the experimental facilities of the great storm basin of the Academy of Sciences USSR, could be confirmed, corrected, and improved under natural conditions.

The Sedov ranged an area reaching into the tropics from a region somewhat south of the Cape Verde Islands and west, partially entering the Sargasso Sea.

The Sedov's course was interesting in other respects. It was very important that the ship reached 16° S latitude in the region halfway between Africa and South America, where a study of the Earth's geomagnetic field could be conducted. It was concluded that the supplementary magnetic field over the expanses of the world's oceans and in particular in the narrow space between Africa and South America, is caused by the effect of marine electric currents. Because of the greater conductivity of the waters, the density of marine electric currents is much greater than the density of earth currents.

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The electric field in the depths of this region of the ocean was investigated. Special electrodes were built on the ship for this purpose. Surface measurements showed that the potential gradient reaches only about 30 millivolts at one kilometer, whereas at a depth of 700 meters the horizontal potential gradient can exceed 100 millivolts at one kilometer. The findings, made by F. A. Gubin and Yu. G. Ruzhkov in the Indian Ocean (1956) aboard the Soviet ship Ob' that the density of marine electric currents increases with depth, were confirmed.

Still another direction of the investigations pursued by the Sedov expedition was the study of the heat balance of the Atlantic Ocean in that part of the ocean traversed by the ship and in the very important last 3 months of the year.

The Soviet oceanographers strove to tie in the climate-forming influence of the ocean with the heat regime of its waters, and especially with the heat balance of the Atlantic Ocean.

Heat balance components were observed from day to day, using a wide expanse of the ocean from the Straits of Dover to a latitude of about 16 degrees, taking advantage of the opportunity of studying the heat regime in the ocean before winter.

All Soviet oceanographic ships operating under the IGY program in the Atlantic Ocean are equipped with automatic apparatus for recording the influx of solar energy which was suggested by Shuleykin and used by the Taymyr hydrographic expedition (aboard the hydrographic ship Taymyr in the White, Barents, and Red seas, and particulary in the Laptev Sea) during the Second International Polar Year.

Fluctuations in the total heat balance are in the greatest degree caused mainly by evaporation.

Investigations revealed that the heat balance of the ocean continuously fluctuates within very wide limits, whereby in the season before winter, the loss of heat, as a rule, is greater than the heat coming from the Sun. It is only on rare days in October and November that the heat balance is positive and even in these cases the total quantity of heat for 5 days was only about 100 small calories per day. It must be noted, says Shuleykin, that at the Tropic of Cancer, and even further south, fluctuations in the heat balance also were rather sharp, even though the number of days here with negative heat balance were about equal to the number of days with a positive balance.

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From the Atlantic, the Sedov entered the Mediterranean. Wind conditions and directions in the region between Tunis and Sicily were studied. A new type of automatic recording wind vane, with which the angle of the wind direction to the meridian is continuously fixed on the usual navigation chart, was successfully built on board the ship. ("Some Investigations on the Oceanographic Ship 'Sedov'," by Academician V. V. Shuleykin; Moscow, Priroda, No 10, Oct 58, pp 59-67)

VI. ARCTIC AND ANTARCTIC

New Staff at Station Vostok

A group of scientists took off by plane from Mirnyy on a flight to the south geomagnetic pole, i.e., to the Station Vostok, where they are to spend many months.

At present, it is mid-summer in Antarctica. The air temperature [at Vostok] is minus 31 degrees Centigrade. However, breathing in the open air is difficult, as the cold air and the low atmospheric pressure make themselves felt.

The new station staff consists of scientists from Moscow and Leningrad, workers of the Arctic and Antarctic Scientific Research Institute. During 1959, nine men will conduct scientific research at the Station Vostok. They are mostly young men; however, some of them have already been in the Arctic or Antarctic. Igor' Tikhomirov, and Vasiliy Kil'dyashev, aerologist, are in the Antarctic for the second time. Before coming to Vostok, Aleksey Semochkin, mechanic, worked for 2 years at the drift stations Severnyy Polyus-5 and Severnyy Polyus-6. Veniamin Ignatov, chief of Station Vostok, and Yakov Baranov, radioman, wintered at Severnyy Polyus-7, and Dmitriy Nizyayev, magnetologist, has been a member of many high-latitude expeditions.

The new staff at Vostok will continue the whole complex of observations begun by their predecessors under the IGY program. The station has modern scientific equipment adapted for work under low temperatures. ("News from Antarctica"; Moscow, Izvestiya, 20 Jan 59)

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Polish Scientists Arrive in Antarctica

A group of Polish scientists arrived in Mirnyy aboard the ship Mikhail Kalinin, together with members of the Fourth Soviet Antarctic Expedition. According to a decision of the Soviet government, the scientific Antarctic station Oazis, 360 kilometers from Mirnyy, has been transferred without any compensation, including all of its equipment, to Poland.

On 23 January, the Polish Antarctic Expedition, headed by V. Krzeminski was transported by plane to the ice airfield located near Oazis. No plane can land directly at the station, as there is no suitable landing strip. From the ice airfield, the members of the Polish expedition were transported to the station by helicopter. The state flag of Poland will be raised at the station Oazis. ("Polish Scientists at Station Oazis"; Moscow, Pravda, 24 Jan 59)

Census of Soviet Personnel in Antarctica

The census of the population at Mirnyy and all of the Soviet interior antarctic stations has been completed. The census was carried out by the sled train, returning from the pole of relative inaccessibility.

According to the census, there are 249 Soviet citizens in Antarctica, including members of the Third Antarctic Expedition, who spent the winter in Antarctica, and the newly arrived staff of the Fourth Antarctic Expedition. Of the total number, 74 persons have higher education and 48 have special secondary school education. Over 50 percent of the men are between 22 and 35 years old. The census lists will be sent to the USSR by the ship Mikhail Kalinin. ("On the Ice Continent"; Moscow, Pravda, 19 Jan 59)

Slava Conducts Scientific Research

In addition to whaling operations, the crew and scientific workers of the Slava whaling flotilla conduct extensive scientific research on the special high-speed vessel Vernyy, and also with the help of helicopters. ("To Create Solid Bases for Whaling in Antarctica"; Moscow, Izvestiya, 22 Jan 59)

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